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Commentary

Significance on Ion Mobility Mass Spectrometry

C. Jaime*

Department of Chemistry, Autonomous University of Barcelona, Bellaterra, Spain

DESCRIPTION

Ion Mobility Spectrometry–Mass Spectrometry (IMS-MS) is analytical chemistry that separates gas phase ions based on their interactions with a collision gas and their masses. An ion mobility spectrometer is used to separate the ions according to their mobility through a buffer gas on a millisecond timescale in the first stage. In a subsequent stage, the separated ions are injected into a mass analyzer, where their mass-to-charge ratios can be measured on a microsecond timescale. This method is widely relevant in the study of complicated samples, such as in proteomics and metabolomics, due to the excellent separation of analyte it achieves.

Sample introduction and ionization

The instrument's first stage is an ion source, which converts samples to gas phase ions. Depending on the physical condition of the analyte, a variety of ionization procedures similar to those used in mass spectrometry have been used for IM-MS. Radioactive ionization, corona discharge ionization, and photoionization procedures are commonly used to ionize gas phase samples. Ionizing samples in solution with electrospray ionization is a typical approach. For large mass molecules, Matrix-Assisted Laser Desorption Ionisation (MALDI) is used, while for smaller mass molecules, Laser Desorption Ionisation (LDI) is used.

Ion mobility separation

Ion mobility spectrometers and mass spectrometers are both available in a variety of configurations. Every type of the former can theoretically be combined with any type of the latter. To obtain reasonable sensitivity, different forms of ion mobility are combined with different types of mass spectrometers in the actual world. Below are the primary types of ion mobility spectrometers that have been connected to a mass spectrometer for IM-MS applications.

Mass separation

A Time-Of-Flight (TOF) mass spectrometer is connected to an IMS in a typical IM-MS apparatus. The TOF-MS has a number of advantages, including a fast data collecting rate and great sensitivity. Because mass spectral data is collected on a microsecond time scale, each IMS spectrum requires many mass spectra (acquired on millisecond timescale). Although at a slower scan rate, the quadruple mass spectrometer has also been connected to an IMS.

Differential Ion Mobility Spectrometry-Mass Spectrometry (DIMS-MS) is a version of IMS-MS that separates gas phase ions depending on their ion mobility under various electric field strengths. Gary Glish and the Glish Group are now promoting this type of analysis.

The length and degree of unsaturation of fatty acyl chains, the head group, and the cationization of particular species are all linked to changes in phospholipid drift time, they discovered. They also showed that phospholipid profiles may be extracted directly from rat brain tissue sections in the same investigation. P hosphatidylcholine, phosphatidylethanolamine, phosphatidylseri ne, phosphatidylinositol, and sphingomyelin all have 22 phospholipid species identified based on drift time.

CONCLUSION

Lipidomics will be impacted in at least two ways by this technology. First, the combination of MALDI and IM-MS enables for the analysis of a wide range of samples, including tissue samples, within a few hundred microseconds of each focused laser desorption pulse being applied to the sample. This could be a viable option for examining the geographical and temporal distribution of cellular liposomes in tissue samples. Second, mass spectrometers with ion mobility cells can separate isomers, isobars, and conformers. This could make it possible to quickly identify new lipid classes and species. Furthermore, chiral isomer analysis could be accomplished by injecting chiral reagents into an ion mobility cell, as described previously.

Correspondence to: C. Jaime, Department of Chemistry, Autonomous University of Barcelona, Bellaterra, Spain; E-mail: carlos.jaim@uab.es

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